Function of the pretarsus in living *Phidippus regius*

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FUNCTION OF THE PRETARSUS IN LIVING PHIDIPPUS REGIUS. D. E. Hill

Since publication of a recent paper on the salticid pretarsus (Hill 1977), I have been able to observe the operation of certain pretarsal structures more directly in living *Phidippus regius* females. Large adults (15-18cm[mm] in length) were observed under a binocular microscope as they walked within plastic Petri dishes. In this manner it is easy to observe the flattening of the distal portions of the tenent setae [tenae] as they are pressed against the plastic surface; interference colors which are undoubtedly due to the regular array of bifid filaments [tenules] are readily observed where the setae are pressed and flattened.

The two [tenent] plates (anterior and posterior) of each pretarsus do not afford a single, flat adhesive surface (composed of the flattened distal portions of tenent setae). Rather, the tenent surfaces corresponding to the two plates are inclined with respect to each other. Thus setae of the anterior plate are used to cling to the surface when the leg is in a retracted position, while setae of the posterior plate are used when the leg is in a protracted position. At intermediate positions the medial setae of both plates are in contact with the surface. Several aspects related to this arrangement are of interest. First, as the spider walks upon a flat surface the legs are rotated as they are alternately protracted and retracted. Second, and in agreement with earlier conclusions, the grip of the tenent setae [ground force exerted on the surface by an *upside-down* spider, associated with tension of tenules, tenae, and legs] is highly directional (directed toward the body of the spider) and depends upon the proper flattening of these setae. The force exerted by the spider against the substratum (grip) [again, ground force] can be readily observed in both the flattening of the tenent setae (distal portions), and occasionally in the direction of slippage when the grip is not secure [for an *upside-down* spider]. As noted earlier, the highly directional nature of the grip is probably the key to the efficacy of rapid release during a walk.

Presumably the difference in structure between anterior and posterior claws can also be related to this rotation of legs during stepping. The anterior claw would be in contact with a silk cable or fabric when the respective leg was in a retracted position, providing a tight grip upon the silk. The posterior claw should be the first to contact the silk during a climb on silk, and the V-shaped notches of this claw should provide a more tentative grasp. Certainly the full significance of this morphology remains to be elucidated. I have been able to observe these spiders walking upon silk within the resting sac, and the role of the claws in catching the silk is readily observed. It also appears that by pulling on the pretarsal depressor the spider can not only extend the claws, but can also pull in [rotate out] the tenent plates somewhat at the same

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time. Presumably the articulation of the inner margin of each plate with the claw lever (via cuticular membrane) is more flexible than I had assumed. Exaggerated movements of the claws and tenent plates can be observed when the legs are being inflated during the molt of these spiders. A general retraction of the pretarsus (claws and plates) appears to accompany grooming of the leg as it is pulled (and "chewed") through the endites (medial brushes) by the spider; this retraction is not complete by any means and it is probably accomplished by a simultaneous pull (in opposition to hydrostatic force) on both the depressor and levator cables.

The plume setae [pilosae] can be used to hook over the edges of leaves by *Phidippus*, and provide a means of grappling with a sharp surface (or an irregular one). In this regard the fact that the greatest development of these setae occurs on the forelegs can be interpreted to correspond with the role of these legs in reaching ahead to new surfaces ahead of the spider as it moves. It is my conjecture that the flexible structure of the whorled setae [spondylae] allows these setae to bend and fall with gravity; thus it is possible that these setae can serve as detectors of the gravity vector (for orientation), in addition to their role as contact chemoreceptors.

REFERENCE:

Hill, D.E. 1977. The pretarsus of salticid spiders. Zool. J. Linn. Soc. London 60: 319-338.